

REMARKS

The Examiner's attention to the present application is noted with appreciation.

Specification.

The amendments suggested by the Examiner have been made.

Claim Comments.

The comments in numbered paragraphs 2 and 4 have been addressed by amendment. With respect to numbered paragraph 3, the phrase "thick-film electrode" is addressed below.

Claim Rejections – 35 U.S.C. § 112.

The claims have been amended as suggested by the Examiner.

Claim Rejections – 35 U.S.C. § 103.

The rejection in numbered paragraph 8 includes therein claims 35 to 40. However, in the more detailed discussion, claim 35 is not discussed. Given that claim 35 depends from claim 34, it is suggested that claim 35 was erroneously included in the list of claims rejected in the first paragraph of numbered paragraph 8.

Neither numbered paragraph 8 or 9 include any rejection of claims 21 to 24 or 34. Applicant assumes these claims are allowable, and further that claim 35 is allowable, subject to resolution of Section 112 issues and incorporation of the limitations of the claims from which they depend.

Applicant further notes that numbered paragraph 9 does not include claim 29, but that claim 29 is thereafter discussed. Applicant assumes that claim 29 was intended to be included in the first paragraph of numbered paragraph 9.

Rejection based on Mathies et al. in view of Wang et al. As noted above, Applicant suggests that claims 1-7, 9-20, 32, 33, 36-40 (but not claim 35) and 42-63 are rejected. The rejection is traversed for the reasons set forth herein.

Claims 1 (apparatus) and 39 (method) have been amended to more clearly claim the invention. In the apparatus and method, the "outlet end" terminates on an edge of the first substrate containing the separation channel. The thick-film electrode is disposed on the second substrate. Thus the media within the separation channel literally exits the channel, by means of the outlet end, and is then position against the thick-film electrode on the second substrate.

The term "thick-film electrode" is a recognized term of art. See, e.g., Wang et al., abstract and page 1, first paragraph through page 2. The thick-film electrode is conventionally made by screen printing or similar means, and has a substantially greater thickness than thin-film electrodes. Thick-film electrodes are described as between about 1 μm to about 100 μm thickness, and preferably between about 8 μm and 30 μm . See specification at page 4, lines 2-4. By contrast, a "thin-film electrode" is made by "RF sputtering" (See Mathies et al., page 6, lines 25-27), and is significantly thinner, such as 3000 Å (0.3 μm) (See Mathies et al., page 7, line 16).

Contrary to the suggestion of the Examiner, Applicant submits that a thick-film electrode could not be combined with the teaching of Mathies et al. to result in a working device. Mathies et al. teaches a device with two parallel "substrates", with the top substrate sealed to the bottom substrate. See, e.g., page 7, lines 4-6, and FIGS. 3, 13A, 13B and 16. Because of the thickness of a thick-film electrode, typically 8 μm to 30 μm , the thickness of the electrode would not permit sealing. Thus a thick-film electrode could not be employed with the device of Mathies et al., which employs a significantly thinner electrode.

Mathies et al. disclose only a working electrode disposed wholly within the confines of substrate. See FIGS. 3, 4, 10, 13B, 14, 15, 18, 20, and 21 of Mathies et al.; page 4, lines 12-18; page 7, lines 4-28. In the preferred embodiment of Mathies et al., the working electrode is a distance (e.g., 20 μm) from "the point of widening" (page 7, line 21), but even where the working electrode is "adjacent the end of the channel as shown in Figure 10" (page 7, line 28), the end of the channel, including the widened portion of the channel, is wholly disposed within the confines of the substrate.

Thus Mathies et al. is distinguished on at least two grounds. First, the “outlet” of the channel is contained within the boundaries of the substrate. By contrast, the invention as now claimed requires that the outlet be an outlet along an edge of the substrate – that is, the outlet literally provides transit from the substrate. It is only by this means that the second distinguishing characteristic is realized; by exiting the first substrate, it becomes possible to employ a thick-film substrate for detection.

The disclosure of Mathies et al. is directed to an embodiment wherein the “substrate is preferably etched so that the electrodes and thin film conducts are insert as shown in Figure 6 whereby the top plate 14 can be effectively sealed to the substrate.” (Page 7, lines 4-6). By contrast, Applicant here has devised an entirely new configuration, wherein the “outlet end” of the separation channel terminates “at the at least one edge” of the substrate. (Claim 1, as amended.) The working electrode (thick-film electrode) is necessarily on a second substrate, and is spaced apart from the “outlet end” a determined distance. In a preferred embodiment (see FIGS. 1a to 1d) the second substrate is perpendicular to the first substrate, such that the fluid within the separation channel literally exits the separation channel and the first substrate, and thereafter is contacted with the thick-film electrode on the second substrate. In another embodiment (see FIG. 34) the two substrates are parallel but offset, such that here too the fluid within the separation channel literally exits the separation channel and the first substrate, and thereafter is contacted with the thick-film electrode on the second substrate.

The invention as claimed herein offers significant and non-obvious advantages not suggested by the cited references. Specifically, as disclosed and claim the thick-film electrode and second substrate can be removably detached from the first substrate containing the separation channel, such that in the event of passivation or fouling the thick-film electrode can be replaced. See page 16, lines 4-12; see *a/so* claim 21; see *a/so* new claims 64-84. Similarly, the distance between the outlet end and the thick-film electrode can be adjusted and controlled; the advantage is clearly disclosed. See Example 6, page 27, lines 1-21.

It may thus be seen that by providing a removable substrate including the thick-film electrode (claim 21, claims 64-84), the design permits convenient and rapid replacement of the thick-film electrode component. This adds great versatility to the operation, particularly in applications requiring frequent electrode replacement. For example, different electrode compositions may be employed with the same separation channel, allowing more accurate comparisons. Similarly, passivated electrodes may rapidly be replaced.

It is submitted that claims 1 and 39 as amended, together with new claim 64, clearly distinguish from the combination of Mathies et al. and Wang et al.

Rejection based on Mathies et al. in view of Wang et al. and further in view of Freemantle. As noted above, Applicant suggests that claims 8, 29, 30, 31 and 41 are encompassed in this rejection. The rejection is respectfully traversed on the grounds set forth above with respect to Mathies et al. and Wang et al., and further on the ground that Freemantle is improperly applied. The Freemantle reference is presumptively and facially dated February 22, 1999; Applicant claims priority to U.S. Provisional Patent Application Serial No. 60/163,852, entitled *Micromachined Electrophoresis Chips with Integrated Thick-Film Electrochemical Detectors*, filed on November 5, 1999. Accordingly, the Freemantle reference is not available under 35 U.S.C. § 102(b). Applicant submits herewith a declaration under 37 C.F.R. 1.131, and accordingly the Freemantle reference is not available under 35 U.S.C. § 102(a).

New Claims

New claims 64 to 84 are added, and are patentable for the reasons set forth above.

Conclusion

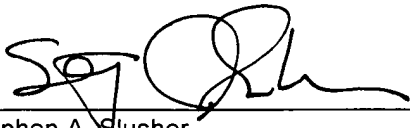
An earnest attempt has been made to respond to each and every ground of rejection advanced by the Examiner. However, should the Examiner have any queries, suggestions or comments relating to a speedy disposition of the application, the Examiner is invited to call the undersigned.

A check for additional claims fees is attached. Authority is given to Deposit Account No. 13-4213 for charge or credit of any additional fees.

Reconsideration and allowance are respectfully requested.

Respectfully submitted,

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